



Is Dragon Fruit a Promising Fruit in Assam: An Economic Feasibility Analysis

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10.18805/ag.R-2765

ABSTRACT

Background: In recent times, some parts of Assam have emerged as excellent destinations for the cultivation of exotic fruits like dragon fruits. But whether this fruit is economically feasible in Assam condition or not, it is important to be analyzed. With this viewpoint, a study was conducted with objectives of examining the economic feasibility of dragon fruit production and identifying the problems faced in production and marketing of dragon fruit by the farmers in Kamrup (rural), Udalguri and Dhubri districts of Assam.

Methods: Respondents were selected through a stratified purposive snowball technique to collect the primary data. To determine the economic feasibility of dragon fruit production, discounting measures of project appraisal viz., net present value, benefit cost (B-C) ratio and Internal rate of return were used.

Result: At 6 per discount rate, the benefit cost ratio and NPV were worked out to be 3.49 and Rs. 8581855 per ha respectively and IRR was reported as 87.21 per cent for 15 years of project appraisal. The major problems identified were high establishment cost in the initial stage, high requirement of labour, General unawareness about dragon fruit and their nutritional importance by consumers and low purchasing power of the consumer. Dragon fruit production was found to be profitable to take as an agribusiness venture. However, proper training and awareness programs are very much needed to popularize the fruits among the farmers as well as consumers.

Key words: Dragon fruit, Economic feasibility, Marketing problems, Production.

INTRODUCTION

Dragon fruit, an herbaceous perennial climbing cactus recently introduced super fruit in the Indian market. The late 1990s saw the introduction of dragon fruit in India (Arivalgan *et al.*, 2019). Farmers from different states like Maharashtra, Karnataka Andhra Pradesh, West Bengal, Telangana, Tamil Nadu, Odisha, Gujarat, the Andaman and Nicobar Islands and many northeastern states have adopted dragon fruit cultivation due to the low maintenance and high profitability. Being a tropical country with a moderate climate all around the year, India is very suitable for dragon fruits as it grows well in tropical climates. Optimum temperatures for growth are 18-25°C, with good relative humidity levels (Nangare *et al.*, 2020).

India's northeastern area is blessed with a wide variety of crops due to its diversified soil and agro-climatic conditions. It serves as a hub for several underutilized horticulture crops that may not be well known in other regions of the nation. Most of the lands in this region are virgin and undeveloped; therefore, they might be used for the cultivation of various crops that are currently becoming more and more popular. The Northeastern region's diversified soil and climate allow for the development of dragon fruit. To meet the current and future demand for this amazing fruit, it would be a great opportunity for the growers to start up dragon fruit farming in the North east India. Farmers of this region may benefit from its cultivation because it is an easy income generation crop due to its early and high-yielding ability. Moreover, there is high

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How to cite this article: Mazid, N.N., Buragohain, R. and Deka, N. (2026). Is Dragon Fruit a Promising Fruit in Assam: An Economic Feasibility Analysis. *Agricultural Reviews*. **47(3)**: 478-482. doi: 10.18805/ag.R-2765.

Submitted: 10-10-2024 **Accepted:** 07-04-2025 **Online:** 13-06-2025

demand for this fruit, especially in this region due to people's awareness of a healthy lifestyle (Thokchom *et al.*, 2019).

It is becoming more well-known in India as a wholesome and therapeutic fruit that is consumed because of its high nutritional content and therapeutic benefits. Dragon fruit cultivation has many opportunities and with the right government support, it can benefit the entire nation and provide enormous prosperity to the farmers (Kikon *et al.*, 2021). But yet, it has not achieved commercial cultivation status in India, despite being grown commercially in other nations. Due to the high demand and small number of commercial growers, dragon fruit is

anticipated to have a very high marketability in the nation (Karunakaran and Arivalagan, 2019). According to a survey of the literature, this crop has received relatively little attention in India (Perween *et al.*, 2018). With this viewpoint, the present study was conducted to know the profitability of dragon fruit in an Indian state Assam with the objectives of studying the economic feasibility of dragon fruit production and identifying the problems in production and marketing of dragon fruit faced by the farmers.

MATERIALS AND METHODS

For the present study, three districts viz., Kamrup (Rural), Udalguri and Dhubri were purposively selected because of the availability of growers. The entire study was conducted based on primary data collected from 2021 through 2022. Since the growers were newly adopting dragon fruit cultivation and scattered in different locations, a stratified purposive snowball sampling design was employed to select respondents. The sample plan was divided into four phases. At first the districts were selected purposively. Secondly the blocks were also purposively selected. After that the villages were selected based on data availability and lastly respondents were selected by snowball method. Since the growers were scattered in different locations within the limited time frame a total number of forty (40) respondents were selected from the selected villages. Primary data for production and marketing of Dragon fruit was collected directly from the farmers in a face-to-face interview method through a pre-tested schedule.

Cost and returns were calculated for 15 years for the dragon fruit. To find out the economic feasibility of dragon fruit production, the following discounting measures of project analysis were used.

A. Net present value (NPV)

$$NPV = \sum_{i=1}^n \frac{B_n - C_n}{(1 + r)^n}$$

Where,

B_n = Benefit or present (Discounted) value of cash inflow in each year.

C_n = Benefit or present (Discounted) value of cash outflow each year.

n = Number of years.

i = Discount rate.

When NPV is greater than 0 i.e. positive, the project is to be accepted.

B. Benefit cost (B-C) ratio:

$$BCR = \frac{\sum_{i=1}^n \frac{B_n}{(1 + r)^n}}{\sum_{i=1}^n \frac{C_n}{(1 + r)^n}}$$

Where,

B_n = Benefit or present (Discounted) value of cash inflow in each year.

C_n = Benefit or present (Discounted) value of cash outflow each year.

n = Number of years.

i = Discount rate.

BCR > 1, then investment in a project is profitable and the project is accepted.

C. Internal rate of return (IRR)

IRR=

$$\frac{\text{Lower discount rate} + \frac{\text{Difference between two discount rates}}{\text{NPW at lower discount rate} - \text{NPW at higher discount rate}} \times \text{NPW at lower discount rate}}{\text{Sum of NPW at lower and higher discount rates}}$$

The ranking of the constraints faced by the respondents in the production and marketing of dragon fruit is done based on percentage analysis.

RESULTS AND DISCUSSION

Among the sample households, 18.43 percent were males and 12.90 per cent were females in the age group below 15 years of age while 29.90 per cent and 27.18 per cent were males and females, respectively in the age group of 15-59 years of age. In the age group of 60 years and above, the same accounted for 7.37 per cent and 4.14 per cent, respectively. Out of the total population of 217 members, 121 were males (55.70 per cent) and 96 were females (44.23) per cent. The total land area under Dragon fruit cultivation was 8.71 ha and the average land is 0.24 ha in the study area.

Table 1 shows the production and productivity of dragon fruit in the sample area for the 1st five years of its life period. The study found that the production of Dragon fruit starts from the second year and it increased year by year. The production for total farms was 313.20 quintals in the second year and gradually increased to 416.68 quintals in the fifth year. The production per farm was 8.94 quintals for the second year and became 11.90 quintals in the fifth year.

Table 1: Production and productivity of dragon fruit in sample area for five years.

Year	Production for total farms (q)	Production per farm (q)	Productivity (q/ha)
1 st	0	0	0
2 nd	313.20	8.94	36.00
3 rd	331.99	9.48	38.06
4 th	365.19	10.43	41.97
5 th	416.68	11.90	47.89

Table 2: Total cost, gross return and net return from dragon fruit cultivation in first five years (Rs per hectare).

Particulars	Years				
	1 st	2 nd	3 rd	4 th	5 th
Establishment cost					
Material cost	10045.00	-	-	-	-
Labour cost	188625.00	-	-	-	-
Total	1050045.00				
Operational cost					
Material cost	-	11049.50	12154.50	13369.90	14706.88
Labour cost	-	153000.00	198900.00	238680.00	262548.00
Total	-	164049.50	210154.50	252049.90	277254.88
Total cost	1050045.00	164049.50	210154.50	252049.90	277254.90
Gross return	0	1029600.00	1091376.00	1200514.00	1369786.00
Net return	-1050045.00	865550.50	881221.60	948464.10	1092531.10

Table 3: Cost and return of dragon fruit production for 15 years per ha.

Year	Cost (Rs)	Gross return (Rs.)
1	1050045.00	0
2	164049.50	1029600.00
3	210154.50	1091376.00
4	252049.90	1200514.00
5	277254.90	1369786.00
6	277254.90	1369786.00
7	277254.90	1369786.00
8	277254.90	1369786.00
9	277254.90	1369786.00
10	277254.90	1369786.00
11	277254.90	1369786.00
12	277254.90	1369786.00
13	277254.90	1369786.00
14	277254.90	1369786.00
15	277254.90	1369786.00
Total	4726103	18389136

Table 4: Benefit-cost ratio, net present value and internal rate of return of dragon fruit production per ha.

Benefit-cost ratio at 6% discount rate	3.49
Net present value at 6% discount rate (Rs)	8581855
Internal rate of return (%)	87.21

Productivity was also seen to be increased from 36.00 q/ha to 47.89 q/ha.

Per hectare different costs and return from Dragon fruit cultivation have been presented in Table 2. The most expensive expenses were incurred for labour, seedlings, fertilizer, manure application, plant protection measures, intercultural operation, training, pruning and harvesting. It can be seen from the table that the total cost, average gross return and net return per year exhibited a positive trend with the increase in production. The farmers could afford to invest more capital in the establishment and

operational cost of the crop and thus by adopting better management practices created better produce which in turn fetched good returns.

From the respondents it was known that dragon fruit attained its full growth period in 5th year and 5th year onward the production was almost the same. Karunakaran *et al.*, (2019) also reported that dragon fruit attains full production within three to five years. In the study, from 5th year onward, the cost and returns were taken as same (as shown in Table 3) without considering the price effect, since the production was the same.

Economic feasibility of dragon fruit production

For 15 years, the benefit-cost (BC) ratio at 6 per cent discount rate, was 3.49. The NPV was Rs. 8581855. The IRR was worked out to be 87.21 per cent (Table 4). Since NPV was positive and the BC ratio was also greater than 1, dragon fruit production was found to be a profitable venture for the growers.

In a similar study, the net present value was found positive (Rs. 2,08,29,478.00), which indicates a worthy investment of the proprietor. Benefit Cost Ratio was also greater than 1 (2.04), which also favored the investment (Kikon *et al.*, 2021)

Identification of the constraints faced by the farmer in the production and marketing of dragon fruit

Constraints faced by farmers in the production of dragon fruit are shown rank-wise in Table 5. The high Cost of Establishment in the Initial Stage was reported as a constraint by all respondents (100%). A huge amount is required for the establishment of a dragon fruit farm. Since most of the farmers were small-scale and marginal farmers it became risky for them to be taken up and hence very few farmers took up dragon fruit farming. Dragon fruit farming also requires much labour because it is a high-maintenance crop. The crop requires proper treatment and operational practices. The requirement of labour was for many operations like manuring, weeding, pruning and maintenance regularly. During monsoon season more labour was required for

Table 5: Constraints experienced by the farmers in dragon fruit production.

Marketing constraints	Per cent of respondents	Rank
High cost of establishment in the initial stage	100.00	I
High labour requirement	94.28	II
High expenditure on fertilizers and plant protection chemicals	77.14	III
Costly planting material	65.71	IV
Disease sensitive	54.29	V
Perishable nature of fruit results in economic losses	31.42	VI

Table 6: Marketing constraints experienced by the farmers.

Marketing constraints	Per cent of respondents	Rank
General unawareness about dragon fruit and their nutritional importance by consumers	77.14	I
Low purchasing power of the consumer	71.42	II
Fluctuation in market prices	48.57	III
Lack of storage facilities	31.42	IV
Lack of proper road connectivity	25.71	V

proper irrigation maintenance and high weed infestation. Planting material was costly compared to the other crops. And in case of any damage the farmer faced loss. Fungal disease was also observed in dragon fruit. Another major blight caused by *Aspergillus fumigates* was mainly due to poor sanitary practices. Lastly, dragon fruit is highly perishable when ripe. Keeping the fruit for a longer period would damage the fruit which eventually results in economic losses.

In Table 6, constraints faced by farmers in marketing dragon fruit were listed rank-wise. The most reported constraint was unawareness about dragon fruit and its nutritional importance by many consumers. People were not aware of the fruit and the health benefits of the fruit. Dragon fruit was not commonly consumed by the people in Assam like other fruits. It was recently introduced in India seven to eight years back. Unfamiliarity of the fruit among the people was one of the major constraints of marketing. Due to the high price, the fruit was not preferred by many consumers, which caused problems in marketing the fruit. Again, as per the seasonal demand and availability of the fruit, there was fluctuation in the market prices of the fruit. Due to the size and perishable nature of the fruit, it was difficult to store the fruit which caused another challenge for the marketers. Since the farmers were scattered and their farms were far from the market, the lack of proper road connectivity caused problems in the transportation of the fruit to the markets.

Wakchaure *et al.* (2021) also reported high cost and non-availability of quality sapling materials, high initial investment of orchard establishment, lack of controlled storage facility, unstable market prices, *etc.* as some major problems of dragon fruit cultivation in India.

Though all possible efforts have been made to determine the objectives of the study, certain limitations do remain. In this study, limited area was covered due to

constraints of very few farmers are engaged with dragon fruit cultivation. So, generalization of the results has been made on the surveyed area only. The primary data collected for the study were based on the respondents recall memory and experience due to lack of data recording habit of farmers and thus may pertain to errors in recalling. Collected data pertains to agricultural year 2021-22. Therefore, conception can be made for that reference period only. Therefore, this study can be treated as baseline study for economic feasibility of dragon fruit in Assam and further research can be done by extending more area of production. Further more research regarding value addition, marketing prospects of dragon fruit in the state *etc* are expected.

CONCLUSION

According to the study, dragon fruit is a crop with high production costs. The net present value was found to be positive, which indicated a worthy investment by the farmer. The benefit-cost ratio and IRR also indicated that Dragon fruit cultivation in Assam is a profitable venture. The fruit has a wide scope in the prospects of its future performance as in its first introduction it performed well. The study revealed that the high cost of establishment in the initial stage, high labour requirement, general unawareness about dragon fruit and their nutritional importance by consumers and low purchasing power of consumers were the major constraints faced by the farmers in the production and marketing of dragon fruit. Provision of Government subsidy on planting materials and other essential agricultural inputs should be incorporated. Emphasis to be laid on bankable projects and support should be extended to the growers for Dragon fruit growers' cultivation on a commercial basis. It can be subjected to value-addition by the production of juice, squash and beauty products like face masks, lip balms, *etc.*

ACKNOWLEDGEMENT

The present study was supported by department of Agricultural Economics and Farm Management under college of Agriculture, Assam Agricultural University, Jorhat.

Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

No animal was harmed during the study.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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